

ABSTRACT OF THE DISCLOSURE

An RMS-to-DC converter implements the difference of squares function using two squaring cells operating in opposition to attain a balance. Each of the squaring cells is

5 implemented as a grounded-base transistor and a two-transistor current mirror. The emitter of the grounded-base transistor is coupled to the input terminal of the current mirror at a node which receives the input signal. The collector of the grounded-base transistor and the output of current mirror are coupled together to generate an output current having a square-law relationship to the input signal. One of the squaring cells receives the input signal and

10 operates at high frequencies (HF), while the other receives a feedback signal and operates in a quasi-DC mode. In a measurement node, a nulling circuit closes a feedback loop around the DC squaring cell to null the output currents from the squaring cells. The nulling circuit includes a filter capacitor for low-pass filtering the output signal from the HF squaring cell, an error amplifier, which is essentially an integrator, for sensing the difference between the

15 currents from the squaring cells, and a circuit for converting the output voltage from the error amplifier to a feedback current for driving the DC squaring cell. The error amplifier includes a resistive load for converting the currents to voltages and a specialized op-amp having high DC precision for sensing the voltage difference. The squaring cell bias current adjusts the input impedance of the cell. The squaring cell may be matched to an external signal source.

20 The dynamic range can be extended by using a non-linear load in the error amplifier and emitter resistors in the squaring cells. The output signal is obtained by replicating the feedback current in a separate path. The two squaring cells are inherently balanced by design and by careful attention to device matching, including cross-quadding of parallel cells, and by using a single bias voltage.

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